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XXI.—*On the Osteology and Dentition of some North American Mastodons.* By JOHN C. WARREN, M.D.

To the Editors of the Annals of Natural History.

GENTLEMEN,

I BEG to communicate to you the following letter which I have received from Dr. Warren of Boston, an excellent anatomist and eminent physician. It contains so many important observations on the osteology and dentition of some of the most complete examples of the North American Mastodon, as leads me to believe you may give it a place in your next number of the 'Annals.'

I am, Gentlemen, your very obedient servant,

London, Feb. 16th, 1846.

RICHARD OWEN.

MY DEAR SIR,

Boston, Jan. 31, 1846.

The interest you have taken in the anatomy of the *Mastodon giganteus*, and the clearness with which you have elucidated many points of their anatomy, lead me to address you at this time.

In the autumn of 1845 the skeleton of a Mastodon, accompanied with two perfect heads, two additional lower jaws, and various other bones, which had been exhumed in the State of New Jersey, was brought to this place. On examination I found it to be the most perfect specimen, which, so far as I knew at that time, had been discovered; I therefore proceeded to examine it with some care, and in the early part of November last made a detailed report of its anatomy to the American Academy of Arts and Sciences, accompanying this report with several drawings. Two of these drawings were of the whole skeleton; the third was of one of the other heads. By the liberality of a number of gentlemen of Boston all these specimens have become the property of Harvard University at Cambridge, three miles from Boston.

In the month of August last we had rumours that the ske-

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leton of another *Mastodon giganteus* had been discovered in the town of Newburgh, State of New York, about six miles from the bank of the Hudson river (in the same town, but not on the same spot, from which the skeleton set up by Mr. Peale was obtained in the beginning of this century), and that it was in every respect more perfect, and perhaps larger than any one yet found. It is worthy of remark, that of five existing specimens of Mastodon, three have been exhumed in the contiguous States of New York and New Jersey; two of them from the same town. Only two or three Mastodon bones have been discovered in any part of New England. The Baltimore skeleton was excavated in the State of Ohio, and the Missourium of the British Museum from the State of Missouri.

After the specimen from Newburgh had been articulated, it was exhibited in the city of New York during the past autumn, and was subsequently brought to the vicinity of Boston by the proprietor, Mr. Brewster. Having satisfied myself of the perfection and the great value of the bones, with a view to the promotion of science and from a conviction of the great injury which would be done to the skeleton by public exhibition in various places, I made offers for its purchase, which were accepted. This invaluable specimen is now my property, and as a duty to scientific men who are interested in the subject, I shall feel myself called on to describe it particularly at a future time in connexion with the New Jersey skeleton.

As the bones were articulated in a manner different from what seemed to me exact, I have had them separated with a view to a new arrangement, founded on the strictest anatomical observation. The skeleton appears to be about twelve feet high, and some idea of the size of its parts may be formed from the fact, that the head is three feet long without the tusks, which were ten feet in length. These dimensions have, however, diminished since the bones were first exposed to the air; the pelvis, for example, which measured six feet two inches at first in its transverse diameter, now measures six feet. The comparative length of the tusks and of the diameters of the pelvic apertures are characters from which I have inferred the New Jersey specimen to have been a female, and my own very probably a male.

The whole head with its teeth is perfect, as is the whole vertebral column, consisting of seven cervical vertebræ, twenty dorsal, three lumbar, and the os sacrum. A solid sternum exists, the posterior part of it only being deficient. The ribs, twenty in number, are perfect. The bones of the pelvis are co-ossified,—a fact which would lead to the suspicion of the animal having been aged; but on the other hand, the epiphyses, although co-ossified with their bones, yet generally exhibit traces of separation. The

bones of the extremities are perfect, with the exception of some of the terminal bones of the feet, and two or three of the intermediate phalanges. Some of these missing bones were removed with the mud and have been recovered; others will probably be found in the spring, after the sun has unbound the surface of the earth.

All the bones are solid, and ring on being struck with a hard substance. Their colour is lighter than that of any of the Mastodon specimens I have had an opportunity of seeing. On the whole, the state of preservation of these bones, considering the miry position in which they had lain for centuries unknown, must be a subject of admiration. They were found together in a very small lacustrine deposit four rods wide by fifteen rods long, where no other bones ever have been or are likely to be discovered, since the deposit has been dug to a considerable depth and removed.

The manner of their discovery was this. In consequence of the uncommon dryness of the season, the proprietor of the farm had determined to remove the deposit for the purpose of manure. After taking away two feet of peat and two feet of red moss, the labourers entered a bed of shell-marl, and at the depth of a foot in this marl the head of the Mastodon was discovered. The thickness of the marl was about three feet, and under it was a bed of vegetable mud, which was penetrated by an iron rod to the depth of twenty feet. The bones, with very slight exceptions, were all lying in their natural relations to each other, the skeleton being in an upright posture, so that there could be no mistake as to the unity of the skeleton, nor as to the relative position of its parts.

I have said nothing of the tusks nor of the teeth.

The tusks are two in the upper jaw and one in the lower. Those of the upper jaw were when discovered about ten feet long (about two feet of which are now decomposed, four feet very much impaired and broken, and the remaining four feet, being the anterior extremity of the tusk, are in an almost perfect state).

The tusk in the lower jaw is single. It is this tusk, which our excellent anatomists, Godman and Hays, considered as the distinctive character of the species *Tetracaulodon*. The perfect resemblance between the bones of my Mastodon and those of the one from New Jersey, most satisfactorily prove that they were both of the same species. The latter specimen is of a younger animal, as shown by the distinctness of the epiphyses, yet it has no tusk in the lower jaw. Whence it follows, that this submaxillary tusk may exist in the early life of both sexes, and disappear in the female at the adult age, but does not belong to a distinct species. The opinion, therefore, which you have

expressed on this point is undoubtedly demonstrated to be exact. This existing submaxillary tusk is eleven inches long, and is situated on the left side of the symphysis of the lower maxillary bone: on the right side is seen the remnant of a socket, which has been filled up, with the exception of about an inch of its anterior part.

The teeth are four in the upper and four in the lower jaw; the points are somewhat worn, but in other respects these teeth are perfect. The anterior have six eminences; the posterior eight, with quite a prominent heel. The front tooth measures four inches by three; the posterior seven inches by three and three-quarters. In this respect they accord with those in the other *Mastodon giganteus*, of which we have spoken above. But in the smaller heads accompanying the latter the number and forms of the teeth were different. The descriptions, as minuted in October last, were as follows:—

“In the youngest of the heads there are three teeth on each side in the upper and lower jaw, of which one, the posterior molar, is not fully developed. In this tooth we have only the crown lying imbedded in its socket, but so loosely that the finger being passed into the cavity of the alveolus is made to penetrate the cavity of the crown. The two anterior teeth are perfect, and contain each six eminences in three rows. At the anterior part of the jaws, in front of the teeth on each side, is an alveolus filled up. The upper and lower jaw nearly correspond. This is the smallest head and evidently that of a young animal; one tusk being only eight inches long on the outside of its socket, the other being broken.

“In the second head, or that of middle size, and this is the most perfect of the three, there are, as in the preceding head, three teeth on each side of each jaw. In addition, the anterior tooth on the left side of the lower jaw, although very much worn, had not dropped out, but was readily removed by the fingers. The surface of its crown was worn quite flat, and one of the fangs wholly absorbed. The anterior tooth on the right side of the lower jaw and both from the upper had dropped out, and their alveoli were nearly filled up; thus making thirteen teeth in the whole.

“In the third or largest-sized head there are only two teeth on each side of each jaw fully developed, and no appearance of a germ, making the whole number but eight. These teeth are much larger than those of the preceding heads, and the posterior tooth has, in addition to eight eminences arranged in two longitudinal rows, a terminal eminence or heel.

“Besides these heads and their appendant lower jaws, there are in this collection two separate lower jaws, both of them be-

longing to young animals. The most perfect of the two is fourteen inches long from the symphysis to the angle, and contains three teeth on each side. The anterior is a small tooth, the crown of which is about an inch square, having two hills, each of them imperfectly divided into two points. These points are worn, and this tooth bears a resemblance to those in the head of a Hippopotamus in my collection. The second tooth is about double the size of the first; it has three hills, the two anterior divided into two points, the posterior is but slightly notched in the middle. The third tooth is double the size of the last, and has like it three hills, each divided into two points. This tooth is, however, buried in the jaw-bone, and was probably during life covered by the gum.

“The most interesting feature in the anatomy of this lower jaw is the existence of two holes at the symphysis, not found in the three other specimens, evidently the sockets of two small tusks. These sockets are an inch and a half deep, and are each of them of sufficient diameter to admit the little finger. The tusks which filled these holes do not exist, but we may suppose them to have been about three inches long, grounding this opinion on the diameter and depth of the holes. In other respects this lower jaw does not differ in its anatomical characters from the remainder above mentioned.”

I have extracted the above minutes from my account of the New Jersey Mastodon, because they serve to support and illustrate the observations you have made on this important topic. They of themselves seem to give a pretty satisfactory view of the dental series in this animal.

To the statements relating to the osseous fabric of the Mastodon I will add a few words on the subject of its supposed food. In connexion with the bones found in the State of Virginia, there was said to have been seen in the situation of the stomach and intestinal canal a quantity of bruised twigs, leaves and other vegetable substances, which probably had composed the food of this animal. Similar substances were discovered in a similar relation to the New Jersey Mastodon so often alluded to, and in our Mastodon about six bushels of such matters were seen in the situation of the stomach and intestines. As the position of the animal had not been disturbed when it was discovered, there is satisfactory reason to believe, that there could be no mistake as to the opinion that these were really articles of food. This opinion receives additional support from the fact stated by the discoverer of the skeleton, that the whole course of the lower intestines could be traced by the food. Accompanying this communication I send you a small portion of these substances, and also

of the great tusks, with some of the marl in which they were imbedded.

You will consider this as a mere sketch, intended to give a general idea of the condition of the two most perfect specimens of *Mastodon giganteus*. At a future period I shall endeavour to give a more detailed account of them, accompanied by the best representations I am able to procure. As my object is the promotion of science, and as the one in my possession is unquestionably the most perfect, if not the largest known specimen of *Mastodon giganteus*, I shall be quite ready to answer any inquiries which you or other scientific gentlemen may propose. I shall also be glad to exhibit the skeleton to any such gentlemen who happening to be in this country may have a desire to examine it. The other skeleton will also, I apprehend, be placed in a situation where it can be examined by those interested in comparative anatomy and palæontology.

I remain, my dear Sir, with great respect, your friend, &c.,

JOHN C. WARREN.

Professor Owen, Royal College of Surgeons, London.

XXII.—*Notice of a Bottle-nosed Whale, Hyperoodon Butzkopf, Lacep., obtained in Belfast Bay in October 1845.* By WILLIAM THOMPSON, President Nat. Hist. and Philosophical Society of Belfast.

[With a Plate.]

IN a paper published in the 'Annals' for February 1840 (vol. iv. p. 375) I noticed seven Hyperoodons—the first of which had previously been most fully described by Dr. Jacob of Dublin—as having been obtained on a limited portion of the coast of Ireland, comprised in less than the northern half of the eastern line of coast, or merely from the bay of Belfast to that of Dublin inclusive. An eighth—about 24 feet in length—examined by Dr. G. J. Allman, was obtained at the island of Ireland's Eye, on the Dublin coast, on the 30th of October 1842. I have now to record the occurrence of a ninth individual procured within the same range of coast. Its capture was thus noticed in one of the Belfast newspapers—the Banner of Ulster—on Friday Oct. 31, 1845 :—

“*A Whale in Belfast Lough.*—On the morning of Wednesday last [29th Oct. 1845] the services of the Coast Guard stationed at Cultra Point were called into active requisition by the appearance of—not a smuggler—but something ‘very like a whale,’ ploughing the waters a few hundred yards from the pier. * * *